

On the Glassy State as a Path for Novel Aluminum Alloys

Metallic glass aluminum alloys are now being considered for applications in the aerospace industry as such alloys offer a significant increase in specific strength over current aluminum alloys. However, metallic glass alloys often exhibit low ductility and as a consequence of this, have found limited application. Recently, an alloy strategy aimed at improving the ductility of these materials has been investigated for Al-Y-Ni-X alloys produced by powder metallurgy. This strategy involves the use of the glassy state as a *path* to achieving novel microstructures, and therefore properties, that cannot be achieved by the processing of crystalline materials. Microstructural evolution in these materials, from powder to extrusion, has been characterized by OM, SEM, XRD and (HR)TEM. It will be shown that the glassy state can be controlled by selection of the correct alloy chemistry and processing route. Alloy formulation, thermomechanical processing, and the resultant mechanical properties will be described. It has been demonstrated that specific tensile strength properties are superior to Ti-6Al-4V from room temperature to 500°F, coupled with elongation to failure from 5 to 15% over the same temperature range.